REPLICATE SAMPLES 4.3.2

The primary purpose of replicate samples is to identify and (or) quantify the variability in all or part of the sampling and analysis system. Replicates—environmental samples collected in duplicate, triplicate, or higher multiples—are considered identical in composition and are analyzed for the same chemical properties. Common types of replicates are described below.

Concurrent Replicate Samples 4.3.2.A

Concurrent replicates are simultaneously collected samples of environmental water used to answer questions such as "What was the variability introduced from collection, processing, shipping, and laboratory handling of the sample?" Concurrent replicates can be designed to assess variability inherent in the system being sampled (Appendix A4-B).

Depending on study objectives, concurrent samples can be collected by using two sampling devices of the same type simultaneously or by filling separate sample-compositing containers concurrently using the same sampling device. The following procedure (from Horowitz and others, 1994) is used at surface-water sites to fill two or more sample-compositing containers (usually churn splitters) and incorporates Clean Hands/Dirty Hands techniques:

1. Complete equipment field-rinsing procedures (section 4.0.2). Label bottles appropriately. Change gloves.
2. At the first vertical of an EWI or EDI section, collect a sample and pour into a field-rinsed churn splitter (section 4.1).
3. Resample the first vertical and pour into the second churn splitter.
4. Move to second vertical, collect sample, and pour into second churn splitter.
5. Resample second vertical and pour into first churn splitter.
6. Collect and pour sample into each churn splitter in this manner for each of the remaining verticals, alternating churn splitters as described in 2-5 listed above.
7. Process and preserve a sample (a) from the first churn, and (b) from the second churn.

4.3.2.B Sequential Replicate Samples

Sequential replicates are samples of environmental water that are collected consecutively instead of simultaneously. Sequential replicates are used to assess variability among samples resulting from collection, processing, shipping, and laboratory procedures conducted at different sampling times. The sequential replicate can be designed to assess sample variability from inhomogeneities in the system being sampled by spacing samples over short or long time periods.

4.3.2.C Split Replicate Samples

Split replicates are samples that are divided into two or more equal subsamples, each of which is submitted to one or more laboratories for the identical analysis. Field-split samples are used to assess variability from sample processing and preservation. Bottles must be appropriately labeled, and the sequence of procedures used must be recorded.

To split a sample into two subsamples after the original has been processed and preserved, use the following procedure (from Horowitz and others, 1994):

1. Wearing disposable, powderless gloves and working inside a processing chamber, start with a full sample bottle of processed (whole-water or filtered) sample.
    - For inorganic samples only, use a bottle rinsed twice with deionized water and then field rinsed with a small volume of processed sample.
    - Do not field rinse bottles for organic samples.
2. Transfer entire contents of first bottle to second bottle, cap second bottle, and thoroughly shake bottle to mix.
3. Pour entire contents of second bottle back into first bottle.
4. Pour one-half of sample from first bottle back into second bottle, then cap both bottles.

To split concurrent replicate samples that were processed through separate compositing devices (such as churn splitters), follow the procedure listed in 1-4 above and label the samples as follows (from Horowitz and others, 1994):

Churn splitter #1: first bottle "Site (X), Sample 1, Split A"
"Site (X), Sample 1, Split B"

Churn splitter #2: first bottle "Site (X), Sample 2, Split A"
"Site (X), Sample 2, Split B"